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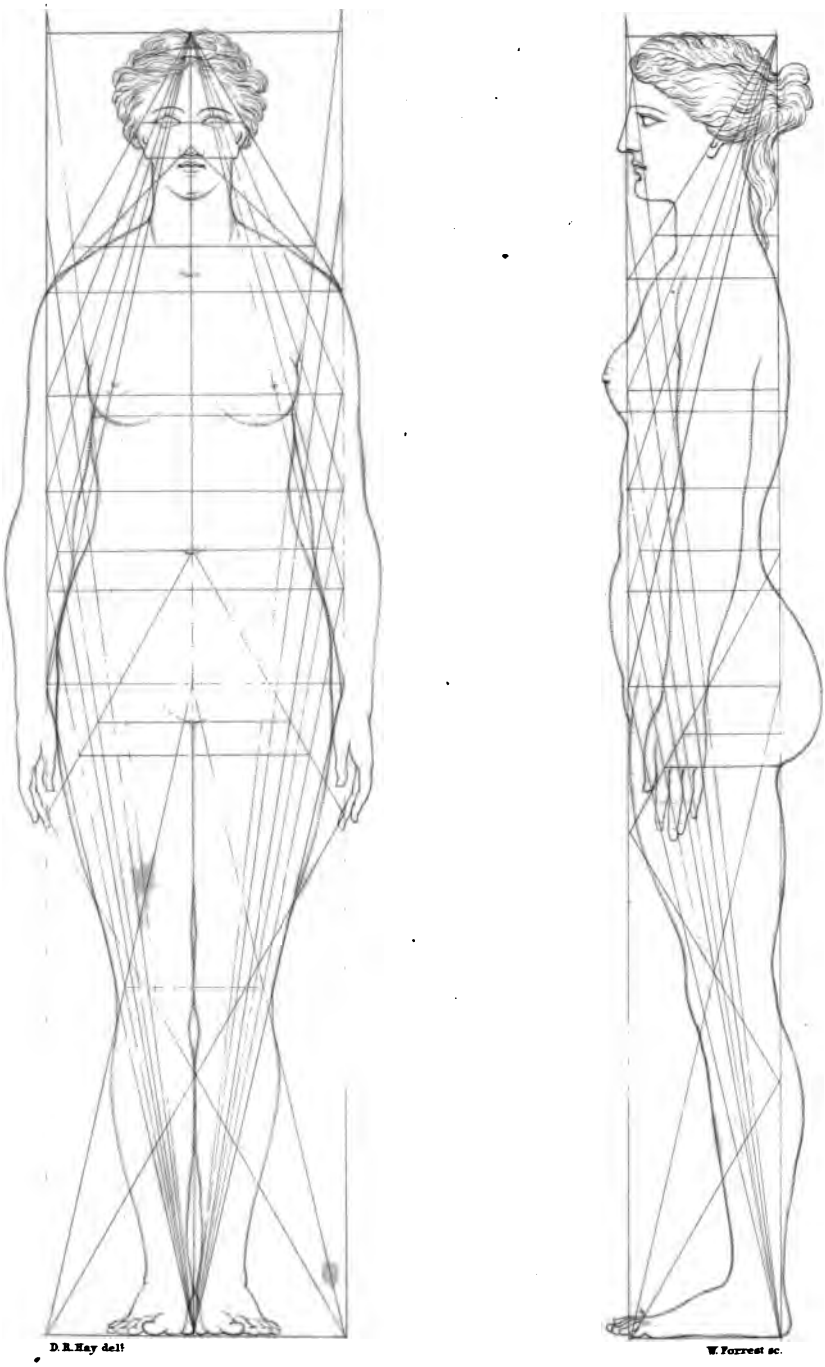


*The female form with the 12 angles which determine its normal proportions*

THE

# NATURAL

# PRINCIPLES OF BEAUTY,

## AS DEVELOPED

IN THE

# HUMAN FIGURE.

BY

D. R. HAY, F.R.S.E.

WILLIAM BLACKWOOD AND SONS,
EDINBURGH AND LONDON.
MDCCCLII.

170. n. 67.

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TO

THE PRESIDENT AND MEMBERS

OF THE

ÆSTHETIC CLUB,

THIS TREATISE, WITH THEIR KIND PERMISSION,

IS

RESPECTFULLY DEDICATED

BY

THE AUTHOR.

# PREFACE.

THIS short Treatise is offered to the Public simply as complementary to the more elaborate works by which its Author has endeavoured to establish his Theory of the Beautiful in Form, which, although here referring only to the Human Figure, is applicable to every species of formative art, from an architectural structure to the meanest household utensil.

It is satisfactory to him on the present occasion to be able to state, that, unlike the generality of New Theories calling in question established errors, it has been the fate of his to encounter but little opposition —and that only of an obviously frivolous nature; while its supporters are already numerous, and include among the most zealous many men of the highest scientific celebrity.

EDINBURGH, *June* 1852.

THE

# PRINCIPLES OF BEAUTY.

## PART I.

The human figure more than any other object in nature exhibits an equally balanced combination of fitness, strength, and beauty; consequently, there are three distinct classes of inquirers into the nature of this great work of creation—namely, the anatomical, the physiological, and the æsthetical. But while its anatomy and physiology have long been justly considered amongst the most useful branches of scientific education, the nature of its æsthetical developments has remained a mystery, and thus artistic genius wants the important advantages to be derived from an early acquired knowledge of the science of its æsthetics, along with the usual knowledge of the elements of its anatomical structure. Although the principles which govern beauty —like those which govern fitness and strength—are in themselves perfect, yet they operate throughout nature in the production of an infinite variety, each individual involving always some deviation from a perfect development. It is this variety which has led some writers to doubt the

existence of a definite law of beauty, and to advance the doctrine that beauty is not a quality in the object itself, but a feeling of admiration originating in the mind of the observer through association of ideas, habit, natural affection, or some other similar cause. But the universal acknowledgment of all civilised nations that the remains of ancient Greek art exhibit in their proportions a degree of beauty to which ordinary nature only approximates, is alone quite sufficient to convince us that the beauty of proportion, at least, is an inherent quality in the object, which, agreeably to a law of nature, is responded to by an equally inherent principle of appreciation in the human mind; and it is to the development of this law as exhibited in the form of the human figure that the following pages, with their illustrations, are principally devoted.

In my last work* it has been shewn that the *æsthetic* developments of the human form agree perfectly with the law of harmonic ratio, which, since the time of Pythagoras, has been acknowledged to be a law of nature, although only partially understood in its application to science — a law identical with that by which, through the organs of hearing, the mind is æsthetically impressed with one of the most refined and delightful emotions which mere sensation is capable of exciting, and on which is necessarily based the fundamental principles of musical composition. But what more especially renders this law the only true basis for a system of proportion is the fact, that it is but another expression of the law which governs the motions and relative distances of those bodies which constitute the universe; and thus, while it is found to act æsthetically on the mind, it also

* *The Geometric Beauty of the Human Figure Defined*, &c. W. Blackwood and Sons, Edinburgh and London, 1851.

satisfies the understanding in the highest branches of philosophical research.

The method by which I have based upon this law a system of proportion, applicable to every species of formative art, has also been explained fully in my last work, and I shall therefore merely indicate it in this place. It consists in dividing the semicircle by 2, 3, 5, and 7, and multiples of these primes, in the same arithmetical progression in which the monochord spontaneously divides itself in the production of the harmonics of sound, and using the angles thus produced in applying harmonic proportion to plane figures through diagonal direction, instead of vertical and horizontal distance. By this means, divisions by two, four, &c., give what may be termed in harmonical phraseology, tonic angles—divisions by three, six, &c., dominant angles—divisions by five, ten, &c., mediant angles—divisions by seven, fourteen, &c., subtonic angles, as fully explained in my last work.

The manner of applying this system in imparting proportions to a representation of the human figure, and thereby synthetically developing in it the operation of the law in question, is to adopt as a fundamental angle, either $\frac{1}{2}$, $\frac{8}{15}$, $\frac{5}{9}$, $\frac{9}{16}$, $\frac{4}{7}$, $\frac{7}{12}$, or $\frac{3}{5}$ of the semicircle, according to whether feminine beauty or masculine power may be the required characteristic of the figure to be represented. For, as in architecture, some structures being designed for temples of worship, and others for castles of defence, their fitness for these purposes will materially affect their respective æsthetic proportions; so likewise in the human figure, the chief characteristic in the typical female form being pure and simple beauty, while that of the typical male form is beauty modified by massive strength, the basis on which each of the figures is constructed might be presumed to have reference to the sen-

sations it would awaken—the one of loveliness, the other of strength. Yet the relative proportions of the parts in each case ought to develop the same æsthetic laws although in different modes. Such are the qualities of fitness which characterise the beauty of the Venus, as compared with that of the Hercules of the ancients, and render these statues perfect types of the sexes.

In the above series of angles, the smallest ($\frac{1}{2}$ the semicircle) gives the proportions of the Venus, and the largest ($\frac{3}{5}$ the semicircle) those of the Hercules; so that the intermediate angles may be adapted to all intermediate classes of proportions, such as were imparted by the ancient Greeks to the statues of their other deities and their heroes.

The angle, adopted as a fundamental or tonic angle (which we shall in the present case suppose to be the first or $\frac{1}{2}$ the semicircle), is divided agreeably to the spontaneous division of the monochord into the following:—

| Tonic angles. | Dominant angles. | Mediant angles. | Sub-tonic angles. | Super-tonic angle. |
|---|---|---|---|---|
| $(\frac{1}{2})$ | $(\frac{1}{3})$ | | | |
| $(\frac{1}{4})$ | $(\frac{1}{6})$ | $(\frac{1}{5})$ | $(\frac{1}{7})$ | |
| $(\frac{1}{8})$ | $(\frac{1}{12})$ | $(\frac{1}{10})$ | $(\frac{1}{14})$ | $(\frac{1}{9})$ |

From the extremities of a vertical line of a given length, representing the full height of the intended figure (whether its dimensions are to be those of a small gem, a colossal statue, or anything intermediate in size), a series of oblique lines are drawn, making with it the above angles; then another vertical line is drawn, the situation of which is determined by the intersection of one of the tonic lines, drawn from one extremity, with one of the dominant lines drawn from the other; and to complete the rectilinear portion of the diagram, a series of horizontal lines are added, whose situations are

also determined by the intersections of the oblique lines. With this rectilinear portion, a series of curvilinear figures are associated, and these belong to the tonic, the dominant, and the mediant angles, and their sizes and situations are determined by the vertical, horizontal, and oblique lines already drawn. Thus simply may diagrams of the human figure be produced of any required dimensions or characteristic proportions.

The diagrams in the work referred to were constructed in the above manner, with a view to determine the following proportions in respect to the human skeleton only:—

The size and form of the cranium—the relative size, form, and position of the entire skull—the position and relative lengths of the cervical, dorsal, and lumbar portions of the vertebral column—the form and relative size of the thorax—the relative length and position of the sternum or breast-bone and ensiform cartilage—the positions of the inferior ends of the first, fifth, tenth, eleventh, and twelfth ribs—the length and position of the clavicles or collar-bones—the relative size and position of the shoulder-blades—the length of the humeri, or bones of the upper arms, with the size of their heads and condyles—the relative length of the bones of the fore-arms, wrists, and hands—the vertical and horizontal lengths of the pelvis, either in the female or male skeleton—the horizontal branch of the pubes—the relative length and position of the thigh-bones, as also of their heads, trochanters, and condyles—and the relative lengths of the bones of the legs, ankles, and feet.* But as the present work is intended to elucidate the operation of the same law on the

* After a very careful reconsideration of this part of the subject, and much additional investigation, I find only two changes requisite in the manner in which the bones are arranged upon the diagram; and they are, that the point

external form, in which the effects only of the proportions of the concealed skeleton are presented to the eye, and as some lines of the original diagrams may now be omitted, and some must also be added, I shall here give in detail the manner of their construction for the external form as I did for the skeleton in the work referred to.

CONSTRUCTION OF A DIAGRAM OF THE FRONT ASPECT OF THE EXTERNAL FORM OF THE HUMAN FIGURE, TAKING THE RIGHT ANGLE AS THE FUNDAMENTAL ANGLE.

Let the line A B (fig. 1, plate I.) represent the height of the figure to be constructed. At the point A, make the angles C A D ($\frac{1}{3}$), F A G ($\frac{1}{4}$), H A I ($\frac{1}{5}$), K A L ($\frac{1}{6}$), and M A N ($\frac{1}{7}$). At the point B, make the angles K B L ($\frac{1}{8}$), U B A ($\frac{1}{12}$), and O B A ($\frac{1}{14}$).

Through the point K, in which the lines A K and B K intersect one another, draw P K O parallel to A B, and through C F H and M, where this line meets A C, A F, A H, and A M, draw C D, F G, H I, and M N perpendicular to A B; draw also K L perpendicular to A B; join B F and B H, and through C draw C E, making with A B the angle ($\frac{1}{2}$), which completes the arrangement of the eleven angles upon A B; for F B G is very nearly ($\frac{1}{10}$), and H B I very nearly ($\frac{1}{9}$).

At the point *f*, where A C intersects O B, draw *f a* perpendicular to A B; at the point *c*, where A K intersects O B, draw *c d* perpendicular to A B; and through the point *i*, where B O intersects M N, draw S *i* T parallel to A C, and S *b* perpendicular to A B.

T should determine the end of the bones of the first instead of those of the second finger, and that the point P should determine the end of the bones of the fifth instead of those of the first toe.

Through *m*, where S *i* T intersects F B, draw *m n*; through *β*, where S *i* T intersects K B, draw *β w*; through T draw T *g*, making an angle of $(\frac{1}{3})$ with O P. Join N P, M B, and *g* P, and where N P intersects K B, draw Q R perpendicular to A B.

On A E as a diameter, describe a circle cutting A C in *r*, and draw *r o* perpendicular to A B.

With A *o* and *o r* as semi-axes, describe the ellipse A *r e*, cutting A H in *t*; and draw *t u* perpendicular to A B. With A *u* and *t u*, as semi-axes, describe the ellipse A *t d*. On *a* L, as major axis, describe the ellipse of $(\frac{1}{3})$.

From a centre Z, describe a circle whose circumference shall touch C D, C F, and A F. With the same radius describe a circle from the centre X, so that its circumference shall touch M N and B U. With the same radius describe a circle from the centre M, and another from the centre T. With the same radius describe a circle from the point *x* in Q R, whose circumference shall touch N P; and with the same radius describe a circle from the centre *y*, where the circumference of the last circle cuts Q R. With the same radius describe a circle from the centre V, whose circumference shall touch K B and B P; and with the same radius describe a circle from the centre *j*, whose circumference shall touch B P.

From a centre *s* describe a circle whose circumference shall touch the lines H K, H I, and A K; and with the same radius describe a circle from the centre *e* in A K, whose circumference shall touch H I. With the same radius describe a circle from the centre *h* in *r o*. With the same radius describe a circle from the centre *k*, whose circumference shall touch F G and A K. Draw similar lines and describe similar circles on the other side of A B, and the diagram is complete.

### CONSTRUCTION OF A DIAGRAM OF THE SIDE ASPECT OF THE EXTERNAL FORM OF THE HUMAN FIGURE.

On one side of a line A B (fig. 2, plate I.) construct the rectilinear portion of a diagram the same as fig. 1. Through *i* draw W Y parallel to A B, and draw A *z* perpendicular to A B. Make W *a* equal to A *a* (fig. 1), and on *a l*, as major axis, describe the ellipse of ($\frac{1}{4}$). Through *a* draw *a p* parallel to A F, and through *p* draw *p t* perpendicular to W Y. Through *a* draw *a f* parallel to A M, and through *f* draw *f u* perpendicular to W Y.

Upon a diameter equal to A E describe a circle whose circumference shall touch A B and A *z*. With semi-axes equal to A *o* and *o r* (fig. 1), describe an ellipse with its major axis parallel to A B, and its circumference touching O P and *z* A. With a radius the same as that of the circle Z (fig. 1), describe from a centre, Z, a circle whose circumference shall touch W Y and C D; describe a circle with the same radius, having its centre X, in W Y, and its circumference touching that line in *i*; and with the same radius describe a circle from a centre, *q*, in M N. With a radius the same as that of the circle *e* (fig. 1), describe from a centre, *e*, a circle touching W Y and H I, and from a centre, *s*, in its circumference, describe with the same radius another circle through *e*, and touching H I. The circles *x*, *y*, *j*, and V, are the same as in fig. 1.

These diagrams, as thus constructed, give the form and perfect proportions of the female figure; and the only change made in their construction (besides the adoption of a greater fundamental angle) in order to give the form and perfect proportions of the male figure, is simply, in the diagram of the

front aspect, to describe the circle X, so that its circumference will touch O B and M N instead of U B and M N. When this change is made in the construction of the diagram whose fundamental angle is the right angle, the human figure drawn upon it would represent a slender male youth; for the characteristics of masculine power can only be imparted by an increase in the fundamental angle, as fully illustrated in the herculean figure given in my last work.

The lateral outline of the female figure, as viewed from the front in a perfectly erect posture, may be traced theoretically upon the first of these diagrams, as follows:—

The outline of the head and face, from point 1 to 3 (fig. 1, plate II.), takes the direction of the two first curves of the diagram.* From point (3), the outline of the sterno-mastoid muscle continues to (4), where joining the outline of the trapezius muscle, at first concave, it becomes convex after passing through (5), reaches the point (6), where the convex outline of the deltoid muscle commences, and, passing through (7), takes the outline of the arm as far as (8). The outline of the muscles on the side, the latissimus dorsi and serratus magnus, commences under the arm at the point (9), and joins the outline of the oblique muscle of the abdomen by a concave curve at (10), which, rising into convexity as it passes through the points (11) and (12), ends at (13), where it joins the outline of the gluteus medius muscle. The outline of this latter muscle passes convexly through the point (14), and ends at (15), where the outline of the tensor vaginæ femoris and vastus externus muscle of the thigh commences.

* Having devoted one of my former works (*On the Science of Proportions*, &c., W. Blackwood and Sons, 1849) exclusively to the form of the head and countenance, I need not enter farther into that part of the subject on the present occasion.

This convex outline joins the concave outline of the biceps of the thigh at (16), which ends in that of the slight convexity of the condyles of the thigh-bone at (17). From this point, the outline of the outer surface of the leg, which includes the biceps, peroneus longus, and soleus muscles, after passing through the point (18), continues convexly to (19), where the concave outline of the tendons of the peroneus longus continues to (20), whence the outline of the outer ankle and foot commences.

The outline of the mamma and fold of the arm-pit commences at (21) and passes through the points (22) and (23). The circle at (24) is the outline of the areola, in the centre of which the nipple is placed.

The outline of the pubes commences at (25) and ends at the point (26), from which the outline of the inner surface of the thigh proceeds over the gracilis, the sartorius, and vastus internus muscles, until it meets the internal face of the knee-joint at (27), the outline of which ends at (28). The outline of the inside of the leg commences by proceeding over the gastrocnemius muscle as far as (29), where it meets that of the soleus muscle, and continues over the tendons of the heel until it meets the outline of the inner ankle and foot at (30).

The outline of the outer surface of the arm as viewed in front proceeds from (8) over the remainder of the deltoid, in which there is here a slight concavity, and, next, from (31) over the biceps muscle till (32), where it takes the line of the long supinator, and passing concavely and almost imperceptibly into the long and short radial extensor muscles, reaches the wrist at (33). The outline of the inner surface of the arm from opposite (9) commences by passing over the triceps

extensor, which ends at (34), then over the gentle convexity of the condyles of the bone of the arm at (35), and, lastly, over the flexor sublimis which ends at the wrist-joint (36).

The outline of the front of the figure commences at the point (1), (fig. 2, plate II.), and, passing almost vertically over the platzsma-myoides muscles, reaches the point (2), where the neck ends by a concave curve. From (2) the outline rises convexly over the ends of the clavicles, and continues so over the pectoral muscle till it reaches (3), where the mamma swells out convexly to (4), and returns convexly towards (5), where the curve becomes concave. From (5) the outline follows the undulations of the rectus muscle of the abdomen, concave at the points (6) and (7), and having its greatest convexity at (8). This series of curves ends with a slight concavity at the point (9), where the horizontal branch of the pubes is situated, over which the outline is convex and ends at (10).

The outline of the thigh commences at the point (11) with a slight concave curve, and then swells out convexly over the extensors of the leg, and, reaching (12), becomes gently concave, and, passing over the patella at (13), becomes again convex until it reaches the ligament of that bone, where it becomes gently concave towards the point (14), whence it follows the slightly convex curve of the shin-bone, and then, becoming as slightly concave, ends with the muscles in front of the leg at (15).

The outline of the back commences at the point (16), and, following with a concave curve the muscles of the neck as far as (17), swells into a convex curve over the trapezius muscle towards the point (18); passing through which point, it continues to swell outward until it reaches (19), half way between (18) and (20); whence the convexity, becoming less and less,

falls into the concave curve of the muscles of the loins at (21), and passing through the point (22), it rises into convexity. It then passes through the point (23), follows the outline of the gluteus maximus, the convex curve of which rises to the point (24), and then returns inwards to that of (25), where it ends in the fold of the hip. From this point the outline follows the curve of the hamstring muscles by a slight concavity as far as (26), and then, becoming gently convex, it reaches (27); whence it becomes again gently concave, with a slight indication of the condyle of the thigh-bone at (28), and, reaching (29), follows the convex curve of the gastrocnemius muscle through the point (30), and falling into the convex curve of the tendo Achilles at (31), ends in the concavity over the heel at (32).

The outline of the front of the arm commences at the point (33), by a gentle concavity at the arm-pit, and then swells out in a convex curve over the biceps, reaching (34), where it becomes concave, and passing through (35), again becomes convex in passing over the long supinator, and, becoming gently concave as it passes the radial extensors, rises slightly at (36), and ends at (37), where the outline of the wrist commences. The outline of the back of the arm commences with a concave curve at (38), which becomes convex as it passes from the deltoid to the long extensor and ends at the elbow (39), from below which the outline follows the convex curve of the extensor ulnaris, reaching the wrist at the point (40).

It will be seen that the various undulations of the outline are regulated by points which are determined generally by the intersections and sometimes by directions and extensions of the lines of the diagram, in the same manner in which proportion was shewn to be imparted in my last work to the osseous structure. The nature of those curves, therefore, and

the mode in which they are thus so harmoniously blended in the outline of the female figure, only remain to be explained.

In my last, as also in several of my former works, I have shewn that each harmonic angle has its own peculiar curvilinear figure, and therefore need give no explanation here of more than those which compose the various outlines of the muscles just detailed. They are given in plate III., and are as follow:—

I.

Curve of the tonic of the first scale of acute angles—the circle, its semi-axis being the side of a right-angled triangle, whose smallest angle is $(\frac{1}{2})$, it may here be termed simply the curve of $(\frac{1}{2})$.

II.

Curve of the dominant of the first scale—the ellipse whose semi-axes are the sides of a right-angled triangle, whose smallest angle is $(\frac{1}{3})$: here termed the curve of $(\frac{1}{3})$.

III.

Curve of the tonic of the second scale—the ellipse whose semi-axes are the sides of a right-angled triangle, whose smallest angle is $(\frac{1}{4})$: here termed the curve of $(\frac{1}{4})$.

IV.

Curve of the mediant of the second scale—the ellipse whose semi-axes are the sides of a right-angled triangle, whose smallest angle is $(\frac{1}{5})$: here termed the curve of $(\frac{1}{5})$.

V.

Curve of the dominant of the second scale—the ellipse whose semi-axes are the sides of a right-angled triangle, whose smallest angle is $(\frac{1}{6})$: here termed the curve of $(\frac{1}{6})$.

The major axes of the first, second, third, and fourth of these curves are the same length as those of the curvilinear figures already in the diagram, and the major axis of the fifth is the

same length as that of the third. The curves which compose the outline of the female form are therefore simply those of $(\frac{1}{2})$, $(\frac{1}{3})$, $(\frac{1}{4})$, $(\frac{1}{5})$, and $(\frac{1}{6})$.

Manner in which these curves are disposed in the lateral outline of the human figure as viewed from the front (figure 1, plate II.):—

| | | Points. | Curves. |
|---|---|---|---|
| Head . . . . | from | 1 to 2 | $(\frac{1}{2})$ |
| Face . . . . | „ | 2 „ 3 | $(\frac{1}{3})$ |
| Neck . . . . | „ | 3 „ 4 | $(\frac{1}{5})$ |
| Shoulder . . . | „ | 4 „ 6 | $(\frac{1}{6})$ |
| „ . . . | „ | 6 „ 8 | $(\frac{1}{4})$ |
| Trunk . . . | „ | 9 „ 15 | $(\frac{1}{4})$ |
| „ . . . | „ | 21 „ 24 | $(\frac{1}{2})$ |
| Outer surface of thigh and leg | „ | 15 „ 20 | $(\frac{1}{6})$ |
| Inner surface of thigh and leg | „ | 25 „ 30 | $(\frac{1}{6})$ |
| Outer surface of the arm | „ | 8 „ 33 | $(\frac{1}{6})$ |
| Inner surface of the arm | „ | 9 „ 36 | $(\frac{1}{6})$ |

Manner in which they are disposed in the outline of the human figure as viewed in profile (figure 2, plate II.):—

| | | Points. | Curves. |
|---|---|---|---|
| Front of neck . . | from | 1 to 2 | $(\frac{1}{6})$ |
| „ „ trunk . . | „ | 2 „ 10 | $(\frac{1}{4})$ |
| Back of neck . . | „ | 16 „ 18 | $(\frac{1}{6})$ |
| „ „ trunk . . | „ | 18 „ 23 | $(\frac{1}{4})$ |
| „ „ „ . . | „ | 23 „ 25 | $(\frac{1}{3})$ |
| Front of thigh and leg . | „ | 11 „ 13 | $(\frac{1}{4})$ |
| „ „ „ . | „ | 13 „ 15 | $(\frac{1}{6})$ |
| Back of thigh and leg . | „ | 25 „ 32 | $(\frac{1}{6})$ |
| Front of the arm . . | „ | 33 „ 37 | $(\frac{1}{6})$ |
| Back of the arm . . | „ | 38 „ 40 | $(\frac{1}{6})$ |
| Foot . . . . | „ | 0 „ 0 | $(\frac{1}{6})$ |

In order to exemplify more clearly the manner in which these various curves appear in the outline of the figure, I give in plate IV. the whole curvilinear figures, complete, to which these portions belong that form the outline of the sides of the head, neck, and trunk, and of the outer surface of the thighs and legs.

The axes of these ellipses form angles with the vertical line, which bear the following harmonic ratios to the right angle:—

| | Parts of Outline. | | Angle to which the curve belongs. | | Angle of inclination of major axis of curve. |
|---|---|---|---|---|---|
| From | 1 to 2 | ... | $(\frac{1}{2})$ | ... | (0) |
| „ | 2 „ 3 | ... | $(\frac{1}{3})$ | ... | (0) |
| „ | 3 „ 4 | ... | $(\frac{1}{5})$ | ... | (0) |
| „ | 4 „ 5 | ... | $(\frac{1}{6})$ | ... | $(\frac{1}{5})$ |
| „ | 5 „ 6 | ... | $(\frac{1}{6})$ | ... | $(\frac{8}{9})$ |
| „ | 6 „ 8 | ... | $(\frac{1}{4})$ | ... | $(\frac{1}{7})$ |
| „ | 9 „ 10 | ... | $(\frac{1}{4})$ | ... | $(\frac{3}{9})$ |
| „ | 10 „ 11 | ... | $(\frac{1}{4})$ | ... | $(\frac{1}{6})$ |
| „ | 11 „ 13 | ... | $(\frac{1}{4})$ | ... | $(\frac{1}{2})$ |
| „ | 13 „ 15 | ... | $(\frac{1}{4})$ | ... | $(\frac{1}{5})$ |
| „ | 15 „ 16 | ... | $(\frac{1}{6})$ | ... | $(\frac{1}{6})$ |
| „ | 16 „ 18 | ... | $(\frac{1}{6})$ | ... | $(\frac{2}{9})$ |
| „ | 18 „ 19 | ... | $(\frac{1}{6})$ | ... | $(\frac{1}{6})$ |
| „ | 19 „ 20 | ... | $(\frac{1}{6})$ | ... | $(\frac{1}{3})$ |

The simplicity and uniformity of the principles on which the human figure is arranged have now been carefully pointed out, particularly the facts—1*st*, That on a given line the figure is developed as to its principal points entirely by lines drawn either from the extremities of this line, or from some obvious and determined localities. 2*d*, That the angles which these lines make with the given line, are all simple multiples or sub-multiples of some given fundamental angle,

or bear to it a proportion admissible under the most simple relations, such as those which constitute the scale of music. 3*d*, That the contour may be resolved into a series of ellipses of the same simple angles; and, 4*th*, that these ellipses, like the lines, are inclined to the first given line by angles which are simple multiples or sub-multiples of the given fundamental angle. From which four facts it results as a consequence that the only effort which the mind exercises through the eye, in order to put itself in possession of the data for forming its judgment, is this, that it compares the angles about a point, and by the power of the eye appreciates the simplicity of their relations. In selecting the prominent features of the body, the eye is not seeking to compare their relative distances—it is occupied solely with their relative positions. In tracing the contour, in like manner, it is not left in vague uncertainty as to what is the curve which is presented to it; unconsciously it feels the complete ellipse developed before it, and if that ellipse and its position are both formed by angles of the same simple relative value as those which aided its determination of the positions of the prominent features, it is satisfied, and finds the symmetry perfect.

Thus there is a perfect harmony of combination in its proportions, associated with as perfect a harmony of succession in its beautifully undulated outline, the curves of which rise and fall in ever-varying degree, and melt harmoniously into one another like the notes of a pleasing melody. When, therefore, we reflect that the scientific investigations of the anatomist have proved that, in the fitness of its parts, the construction of the human frame exhibits the closest approximation in nature to a perfect development of mechanical science, and that the similar investigations of the physiologist have proved that the processes by which it is sustained in

vital energy exhibit the closest approximation in nature to a perfect development of chemical science, it cannot in any way be surprising to find that, in like manner, and agreeably to a definite and acknowledged law, the beauty of its form discloses the nearest approximation in nature to a perfect development of the science of æsthetics.

I shall therefore conclude this part of the subject by saying, in humble imitation of a great philosopher of antiquity, that "if any one can prove that he has found any 'method' yet better, and more suitable, he shall be treated, not as an enemy, but as a friend, and his ideas shall prevail."

# PLATE I

*Fig.* I.

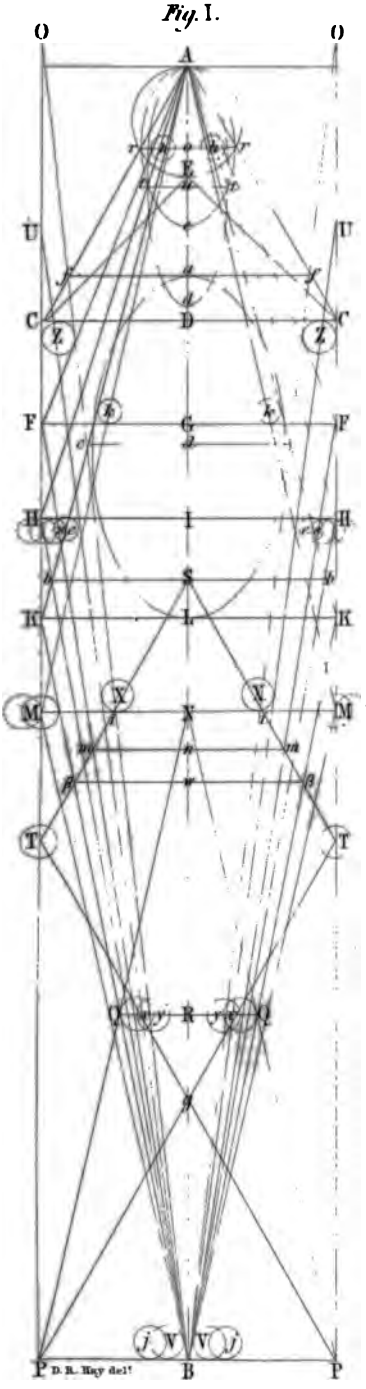
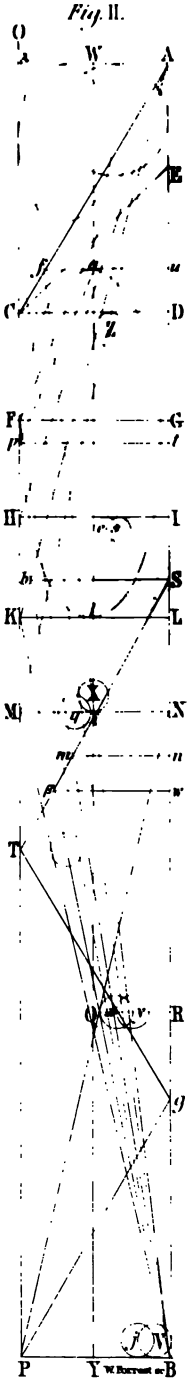


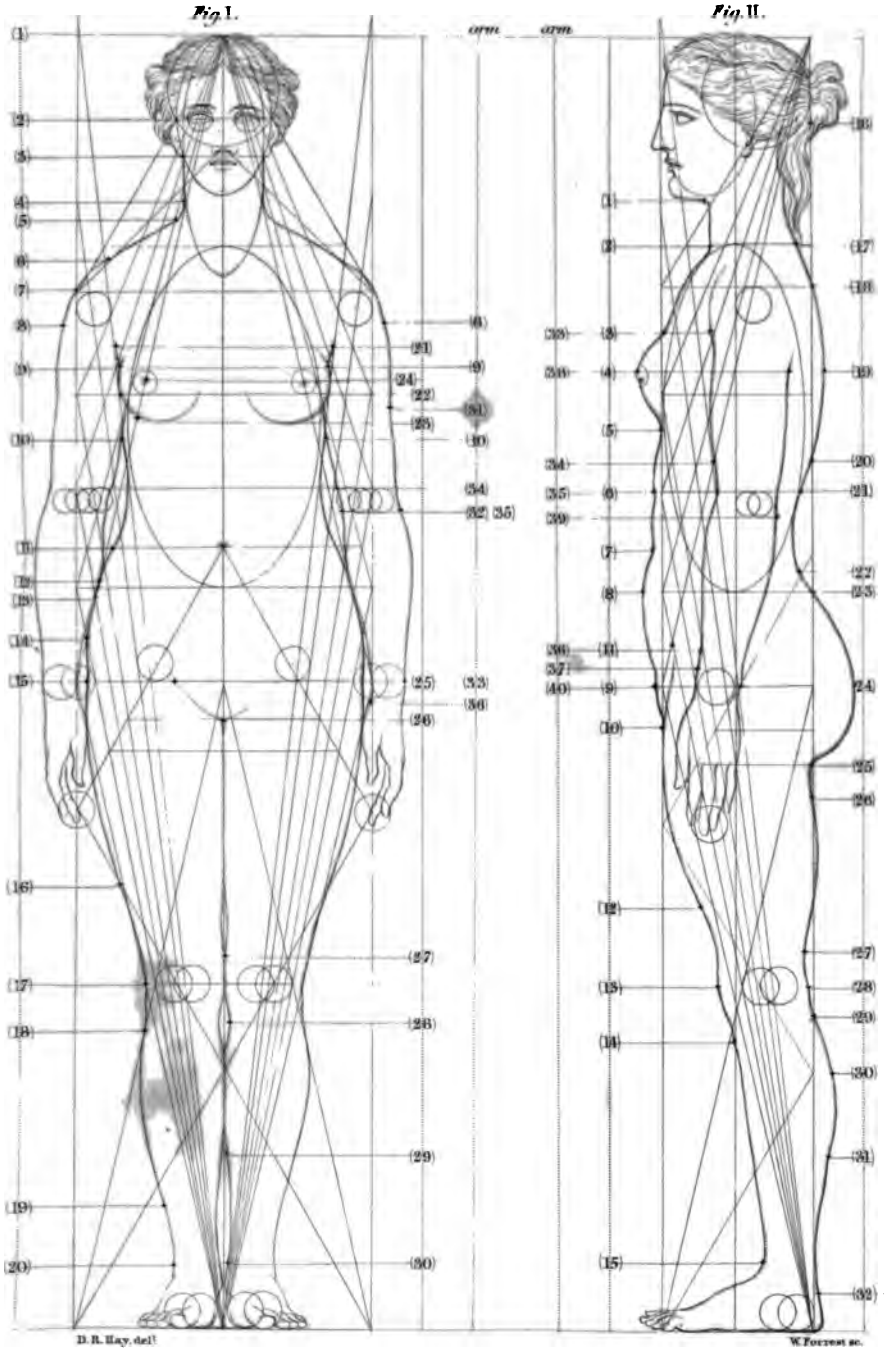

*Fig.* II.




*Erratum.*

*In the text P.14. the words through a draw a f parallel to A M are superfluous*

# PLATE II



# PLATE III

*With a view to perspicuity the curvilinear figures are here given on a larger scale than those employed in the diagrams.*

*Fig.* I.

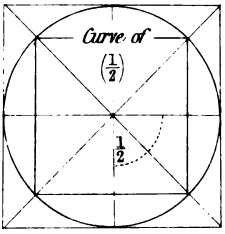



*Fig.* II.

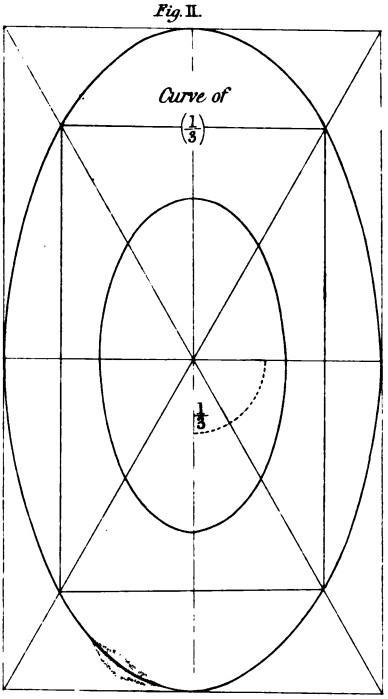
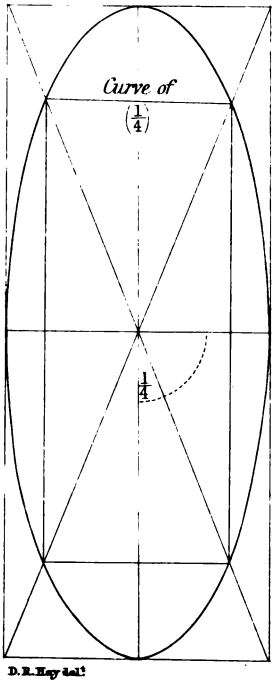



*Fig.* III.




D. R. Hay del.t

*Fig.* IV.

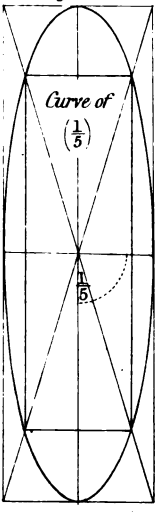
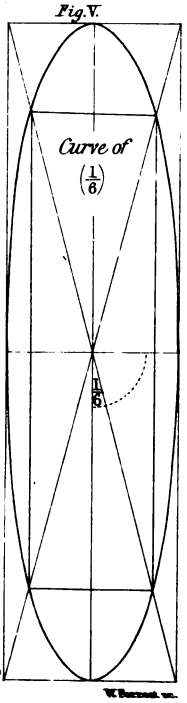
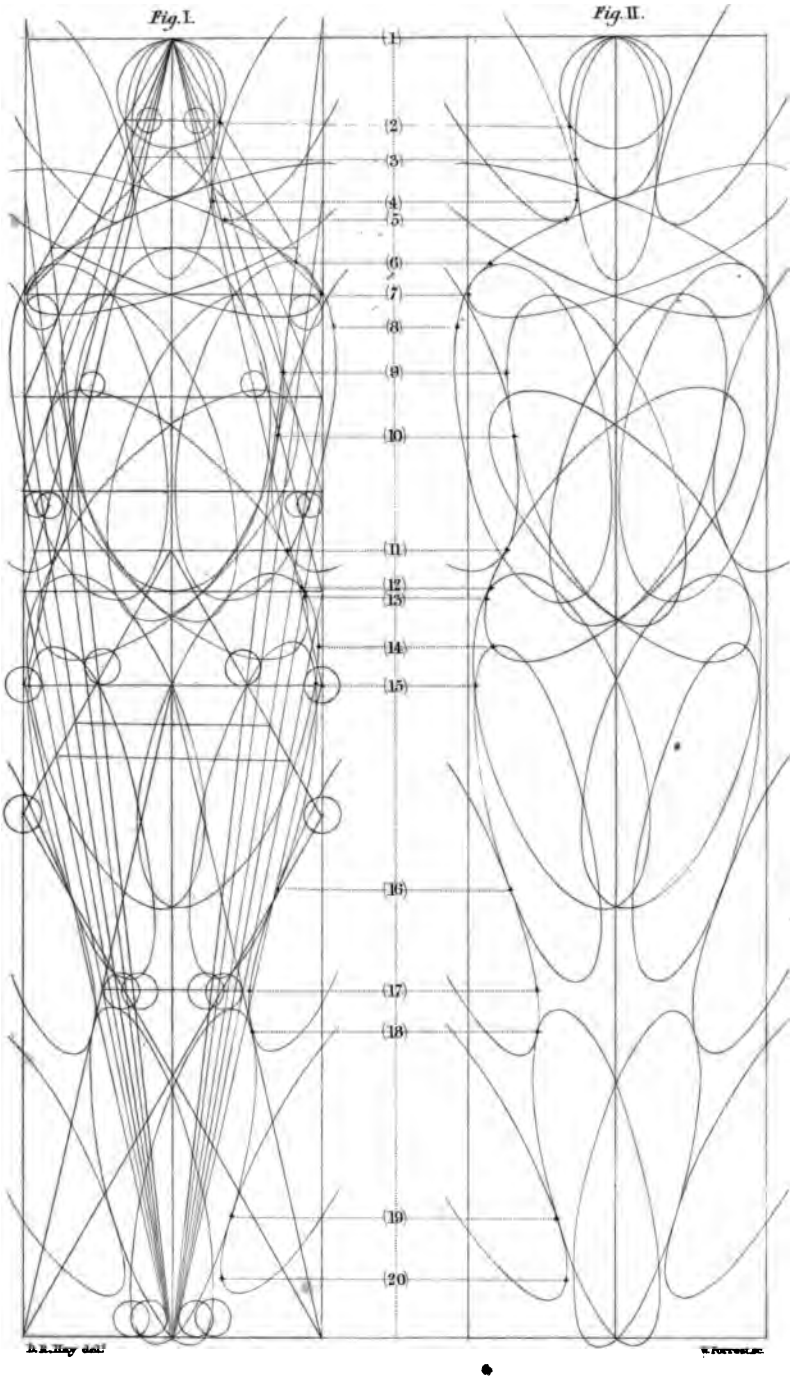



*Fig.* V.




W. Barnard sc.

# PLATE IV



# PART II.

Being anxious to ascertain, in the first place, in how far this theoretical figure agreed in its proportions with ordinary nature, and, in the second, with those beautiful fragments of ancient Greek sculpture which have for so many centuries been considered the only perfect models of excellence to which the artist could refer, I resolved to enter upon a careful investigation. Feeling, however, that I could not look forward to any very satisfactory result without having recourse to practical science, I made my wishes known to the Rev. P. Kelland, Professor of Mathematics, and to John Goodsir, Esq., Professor of Anatomy, both of the University of Edinburgh, and craved their advice and assistance. This they at once kindly agreed to afford me, by devoting their leisure to the subject during the summer vacations of their classes in 1851. And the valuable assistance thus offered in the search after truth, was not performed hastily, but with extreme care, occupying more or less of their leisure time every week from June to October.

Confining ourselves in the meantime to the female form, as apparently based on the simplest fundamental angle, we directed our attention to the first object of inquiry, namely —whether this theoretical figure agreed so closely with ordinary nature as to warrant the conclusion, that the theory upon which it is constructed is a natural principle, universally

developed in the structure of the human form, determining its general figure and proportions; and that, consequently, the endless variety found to exist among the forms of mankind may be considered simply as deviations, in various directions, from an exact development of a certain law of nature.

In order to determine this point, we commenced by procuring the measures of the distances of several leading points in as many female models as we could obtain. The number of these living models amounted to six, most of whom were such as attend the life academies and private studios of artists. The leading points measured were the full height of the figure, the vertical length of the head, the vertical position of the superior end of the sternum or breast-bone, of the nipples, of the navel, and of the horizontal branch of the pubes. To these were added, the width across the top of the shoulders, width between the nipples, width across the pelvis, and depth of the chest below the breasts.

These actual measurements from nature are given in inches in No. 1 of the two following tables, and are compared with those of the theoretical figure in No. 2, the full height being taken as unity.

# TABLE I.

## ACTUAL OBSERVATIONS ON THE HUMAN FIGURE IN INCHES.

| | DESIGNATION OF MODEL. | No. 1. | No. 2. | No. 3. | No. 4. | No. 5. | No. 6. |
|---|---|---|---|---|---|---|---|
| i. | Full height of figure, . . . . . | 61 | 59·75 | 60 | 59·125 | 68·375 | 62·5 |
| ii. | Vertical length of head, . . . . . | 9·25 | 8.125 | 8·25 | 7·875 | 8·25 | 7.75 |
| iii. | Vertical distance from summit of head to superior end of sternum or breast-bone, . . | 10·75 | 11·125 | 11·5 | 11·25 | 12·125 | 11·25 |
| iv. | Verticle distance from summit of head to a point exactly between nipples, . . . . . | 17·25 | 16·5 | 16·75 | 16·875 | 18·875 | 16·5 |
| v. | Vertical distance from summit of head to navel, . | 25·625 | 23·5 | 24·75 | 24·125 | 26·875 | 25 |
| vi. | Vertical distance from summit of head to pubes, . | 31 | 30·25 | | 29·875 | 34·125 | 31 |
| vii. | Breadth across top of shoulders, . . . . . | 15 | | | 13·25 | 13·5 | 14·25 |
| viii. | Breadth between nipples, . . . . . | 7·75 | 8·125 | 7·5 | 7·375 | 8·25 | 7·75 |
| ix. | Breadth across head of pelvis, . . . . . | 10·25 | | | 10·5 | 12·5 | 12·125 |
| x. | Depth of chest below breasts, . . . . . | 7·5 | | | | 7 | 7 |

# TABLE II.

COMPARING THE THEORY OF SYMMETRICAL BEAUTY EXPLAINED IN THE FOREGOING PAGES WITH ACTUAL MEASUREMENTS TAKEN FROM NATURE. THE FULL HEIGHT TAKEN AS UNITY.

| | PARTS MEASURED. (See Table I.) | THEORETICAL VALUES. | ACTUAL MEASURES OF MODELS. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | No. 1. | No. 2. | No. 3. | No. 4. | No. 5. | No. 6. | Average. |
| ii. | Length of head, . . | ·12536 | ·1516 | ·1359 | ·1375 | ·1332 | ·1206 | ·1240 | ·1339 |
| iii. | From summit of head to sternum, . . . | ·19020 | ·1762 | ·1861 | ·1916 | ·1903 | ·1773 | ·1800 | ·1836 |
| iv. | Do. to between nipples, | ·26692 | ·2827 | ·2761 | ·2791 | ·2854 | ·2760 | ·2640 | ·2772 |
| v. | Do. to navel, . . . | ·40263 | ·4200 | ·3933 | ·4125 | ·4080 | ·3930 | ·4000 | ·4031 |
| vi. | Do. to pubes, . . . | ·50018 | ·5081 | ·5051 | | ·5052 | ·4990 | ·4960 | ·5029 |
| vii. | Breadth across shoulders, | ·22832 | ·2459 | | | ·2241 | ·1974 | ·2280 | ·2238 |
| viii. | „ between nipples, | ·12582 | ·1270 | ·1359 | ·1250 | ·1247 | ·1206 | ·1240 | ·1262 |
| ix. | „ across pelvis, . | ·18090 | ·1680 | | | ·1775 | ·1828 | ·1940 | ·1805 |
| x. | Depth of chest, . . | ·11416 | ·1229 | | | | ·1023 | ·1120 | ·1124 |

It will be observed that the average length of the heads of the models is greater in proportion to the full stature than that of the head of the theoretical figure. But this is sufficiently accounted for, from the circumstance of four of these females being below the ordinary stature; for it will be observed that the lengths of the heads of the other two are rather less, relatively to the full stature, than that of the theoretical figure. Although various causes prevented the same extent of measurement being taken from each of the models, it is presumed that enough has been given in these tables to shew that this system of æsthetic proportion is sufficiently developed in ordinary nature to warrant the belief that it constitutes the general beauty of the human figure, although not perfectly developed in any individual.

In order to decide as to the second object of our inquiry —namely, whether the proportions of this theoretical figure agree with those given to the female form by the sculptors of ancient Greece—we selected the Venus of Medicis, as one of the finest and most complete specimens by which the theory could be tested.

We found the position of this celebrated statue to be such that, whilst every part suffers more or less of vertical depression,* the other dimensions (with very slight exceptions, to be afterwards mentioned) are but little affected. The prin-

* By depression is meant the difference between the vertical distances of any two points when the model is upright, and when in the position of the Venus. The depressions occasioned by the human figure assuming the posture of the Venus of Medicis are owing to the forward and lateral bending of the cervical portion of the vertebral column, the forward and lateral bendings of the dorsal and lumbar portions of the same column, the forward bending of the knee and ankle-joints, and the lateral bending of the hip-joint.

cipal object of our inquiry, therefore, was to ascertain what would be the vertical distances of certain definite points on the figure, supposing it to be placed upright. To effect this object, four of the already selected points were employed, viz., the superior end of the sternum, the centre between the nipples, the lower edge of the navel, and the horizontal branch of the pubes. These points, after very careful consideration by Professor Goodsir, and his demonstrator, Mr Zaglas, were marked on the cast of the Venus. Their vertical height, along with that of the whole figure, was then ascertained with extreme accuracy by means of a plumb-line and spirit-level.

A machine was now constructed, consisting of a basement of about three feet square, to one side of which two perpendicular posts, of about seven feet in length and one inch apart, were fixed and steadied by being braced from behind. At the top of these posts a strong vertical clamping screw was fixed, and in the space between them a series of pointed square rods, two feet long and one inch thick, were piled. In this machine the cast was placed, with its back towards the ends of the rods, which were then moved forward until those opposite the back of the statue, from the heel to the summit of the head, all touched it. The statue being now withdrawn, a correct outline of its back was left. This was now clamped firmly, the object being to enable a living person of nearly the supposed height to assume and maintain the exact figure of the Venus. The model No. 1 was, from various considerations, selected; and it was found that, by standing on a board one inch thick, this female was enabled to assume most accurately the required position, and to continue in it by means of supports. The vertical distances of the five points were then carefully measured, and the results compared with the mea-

sures in the upright position, as detailed below. A second process consisted in placing the cast with its front to the machine, and causing the rods to come in contact only with the five points of which the height was required, and repeating the same with the model. The results of this coincided with those of the first process.

It will be observed that the model No. 1 is shorter than the Venus, and consequently every depression ought strictly to be increased in the proportion of 31 : 30; but as the whole addition due to this cause could be only $\frac{1}{8}$ of an inch, and as fractional parts of $\frac{1}{8}$ of an inch have been in all cases rejected, it was not thought desirable to take this circumstance into account at all.

The following are the results:—

Measurement of cast of the Venus of Medicis, expressed in inches of vertical height from the ground.

| Crown of head. | Superior end of sternum. | Centre of each breast. | Lower edge of navel. | Horizontal branch of pubes. |
|---|---|---|---|---|
| (I.) | (II.) | (III.) | (IV.) | (V.) |
| 58·75 | 48·25 | 43·375 | 36·125 | 30·625 |

which gives the following vertical distances:—

| | |
|---|---|
| Between crown of head and superior end of sternum, . . . | (I.) 10·5 |
| Between superior end of sternum and centres of breasts, . . | (II.) 4·875 |
| Between centres of breasts and lower edge of navel, . . . | (III.) 5·25 |
| Between lower edge of navel and horizontal branch of pubes, . | (IV.) 5·5 |
| Between horizontal branch of pubes and ground, . . . | 30·625 |

Measure of model No. 3, placed with back and face alternately several times to the points of the machine in the position of the Venus of Medicis, expressed in vertical distances.

| (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|
| 9·5 | 6·375 | 7 | 4·75 | 29·125 |

Same distances when the model is placed upright.

| (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|
| 10·75 | 6·5 | 8·375 | 5·375 | 30 |

Depression of model due to the assuming of the position of the Venus of Medicis of the five following lines.

| (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|
| 1·25 | ·125 | 1·375 | ·625 | ·875 |

It will be seen that the sum of the vertical heights of the lines measured on the model in the position of the Venus of Medicis and these depressions give the exact vertical height of the model. Now, as we have said the total difference between the depressions of the model and those of the Venus ought not to exceed $\frac{1}{8}$ of an inch, omitting these differences altogether, and assuming that the depressions of the Venus are the same as those of the model, we get by addition—

| | (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|---|
| Vertical distances of Venus in position, | 10·5 | 4·875 | 7·25 | 5·5 | 30·625 |
| Depressions, | 1·25 | ·125 | 1·375 | ·625 | ·875 |
| | 11·75 | 5 | 8·625 | 6·125 | 31·5 |

which are the vertical distances between the said points; consequently, the vertical heights of these points from the ground are—

| | (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|---|
| | 63 | 51·25 | 46·25 | 37·625 | 31·5 |
| Or measured downwards, . . | 63 | 11·75 | 16·75 | 25·375 | 31·5 |

The theoretical values of the same lines corresponding to height 63 are—

| | (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|---|
| | 63 | 11·982 | 16·816 | 25·365 | 31·511 |
| And, consequently, discrepancies are, | 0 | ·232 | ·066 | ·01 | ·011 |

all in parts of an inch; so that the greatest discrepancy between theory and the measure is less than $\frac{1}{4}$ of an inch.

It is requisite here to state, that our selection of the model No. 1 for this process arose from the circumstances of her having that flexibility in the vertebral column which enabled her to give with ease the forward and lateral bendings upon which the principal depressions produced by the posture of the Venus so much depend, and having the greatest experience in assuming and preserving postures.

In order, however, to test this very satisfactory result, we determined to work out the same process by another model. For this purpose, we selected No 5. Measuring to the ground, and including the fifth in the fourth, we found the depressions to be—

| (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|
| $4\frac{7}{8}$ | $3\frac{1}{4}$ | 3 | $1\frac{1}{2}$ | |

From which deduct $\frac{1}{12}$ on account of the greater height, there remain depression due to Venus—

| | (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|---|
| | $4\frac{1}{2}$ | 3 | $2\frac{3}{4}$ | $1\frac{3}{8}$ | |
| Which add to cast, | $58\frac{3}{4}$ | $48\frac{1}{4}$ | $43\frac{3}{8}$ | $36\frac{1}{8}$ | |
| gives, | $63\frac{1}{4}$ | $51\frac{1}{4}$ | $46\frac{1}{8}$ | $37\frac{1}{2}$ | |
| The theory for $63\frac{1}{4}$ is | $63\frac{1}{4}$ | 51·23 | 46·367 | 37·783 | |
| Difference, | 0 | ·02 | ·242 | ·283 | |

From this it would appear that the height of the Venus in an erect posture would be about 63¼ inches; yet, when we considered, in connexion with the greater experience of the former model, that this latter result arose from a process performed at a period of our proceedings when the same amount of care could not be bestowed upon it which was formerly given to the working out of the same question, we resolved to adopt 63 inches as being the most likely of the two to be the proper height. It is, therefore, open to those who may have the advantage of examining the original marble, by the same process we have employed upon the cast, to determine which of the two is the more correct, if so trifling a difference as at most would only amount to $\frac{1}{252}$ of the full height be thought worth the trouble. However that may be, the results we have arrived at are quite sufficient to prove an agreement between the relative proportions of the Venus of Medicis, and those of the theoretical figure produced by the division of the right angle according to this system of æsthetic proportion, so remarkable that, when taken in connexion with other modes of applying the same theory, which I have from time to time published, it warrants the belief in a similar system having formed the basis of artistic education among the ancient Greeks at the period of their greatest excellence in the arts of design.

Still further to test these results, we measured a cast of that beautiful fragment of Grecian sculpture called the Venus of Melos, and found the heights of the five points to be from the ground as follows, or very nearly:—*

* This qualifying expression is here used because the measurements which follow were made in a gallery open to the public at the time, and because, in consequence of the height of the pedestal, we could only take them by means of step ladders. Still, great care was taken, and the plumb-line and spirit-level were used throughout.

| (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|
| 79 | $65\frac{1}{4}$ | 59 | $47\frac{7}{8}$ | $40\frac{1}{2}$ |

Comparing very carefully the posture of this figure with that of the Venus of Medicis, and taking into account its greater height, we calculated that the following must be very nearly the depressions due to that posture:—

1*st*, To the lateral inclination of the head, along with the forward and lateral bending of the cervical portion of the vertebral column, 2 inches.

2*d*, To the lateral bending of the dorsal and lumbar portions of the vertebral column, $1\frac{1}{2}$ inches.

3*d*, To the forward bending of the ankle and knee-joints, and lateral bending of the hip-joint, $1\frac{1}{2}$ inches.

These depressions amount to 5 inches in all; so that the full height of the figure in a perfectly erect posture would thus be 84 inches. When these are added, in the following order, to the measurements taken from the cast, they give the vertical distances from the ground to the five points in an erect posture, thus:—

| | (I.) | (II.) | (III.) | (IV.) | (V.) |
|---|---|---|---|---|---|
| Measurements of cast, | 79 | $65\frac{1}{4}$ | 59 | $47\frac{7}{8}$ | $40\frac{1}{2}$ |
| Depressions, . . . | 5 | 3 | $2\frac{3}{4}$ | $2\frac{1}{8}$ | $1\frac{1}{2}$ |
| Gives . . . . | 84 | $68\frac{1}{4}$ | $61\frac{3}{4}$ | 50 | 42 |
| Theoretical values of height 84, . | 84 | 68 | $61\frac{1}{2}$ | $50\frac{1}{8}$ | 42 |
| Discrepancies, | 0 | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{8}$ | 0 |

The two first discrepancies being plus, and the third minus, the whole amount is only $\frac{1}{224}$ of the full height of the figure. The agreement is therefore so very close as to be quite

sufficient to shew that a class of proportions have been imparted to this exquisite work similar to those which characterise the Venus of Medicis; thus adding another proof of the truth of the theory with reference to one of the finest specimens of ancient Greek art in existence.

During these proceedings we had encountered some anatomical obstacles, such as the difficulty of ascertaining upon the external surface of the figure the exact point of articulation between some of the bones, and the extent of the action of some of the joints, in none of which could reference to an artificial skeleton aid us. These difficulties, however, Professor Goodsir completely removed, by having a natural skeleton of a young female prepared, with all its ligaments and cartilages entire, by which we were enabled to find the points required, and more accurately to ascertain the extent and nature of the bending of the vertebral column and other parts of the frame.

The perfectly erect posture of a human figure, like the geometrical elevation of an architectural structure, is the only one in which it is possible correctly to develop or apply any system of proportion with absolute accuracy. Thus, then, in its artistic representations, the sculptor could, by the adoption of this system, first arrange the framework for his clay model agreeably to a definite law of proportion, and, as this law determines the centres of the motions of the various joints, he would thereby be enabled, with that elementary anatomical knowledge which relates to the extent and nature of these motions, to bend this framework into any posture of which the human form is capable without affecting the proportions in any degree.

The process of modelling upon such a framework would naturally proceed without the fear of error in the proportions or attitude of the figure; and this vantage-ground would

enable the artist, in the further progress of his work, to devote his undivided attention to what genius alone can add to perfect proportion and natural posture, viz., grace and expression.

The only kind of drawing by which a system of æsthetic proportion can be illustrated is necessarily of a geometrical character; and every student in the graphic art ought to acquire, in the first instance, a knowledge of proportion by that species of drawing alone. For, unless he comprehends the relative lengths and breadths of the various parts of the human figure geometrically, and be capable of so representing it, he will never be able to represent it in a natural position, or in perspective, with the same degree of truth, certainty, and ease.

In conclusion, it may be briefly noticed that we are here presented with a new chapter in that great lesson which it is one of the ends of all scientific inquiries to unfold—the lesson which is written on the aspect of all created nature—that it is the work of manifold wisdom. Even left to the guidance of his unexpanded reason, the rudest savage must infallibly have arrived at the conclusion, that a machine so vast as that which moves around him owed its construction to an all-powerful Being; and as the intellect of man expanded, so must his conclusions have strengthened and widened into a broad and settled assurance, that a system so perfect required a wise and far-seeing Designer. As ages roll on, that which appears at first to be the result of obvious and striking phenomena becomes elaborated into a chain of the strongest evidence, so that ultimately it will be easier to convince him who has penetrated beyond the surface of nature that his senses deceive him, than that his reasonings based on them can be

erroneous. The heavenly bodies could scarcely have failed to point out the existence of their Maker, even in the earliest ages; but how much stronger is the evidence they afford to the modern philosopher, when he sees them harmoniously revolving under the influence of a simple law—a law which, as an invisible chain, binds every atom of material nature into a perfectly-balanced whole! The wonder which is inspired by the vastness of the scene is regulated by the contemplation of its simplicity—he discovers that the near and the remote, the minute and the infinite, the slowly rolling and the rapidly flashing, are all influenced by this beautiful and comprehensive principle—that *Everything is effected by means more simple than any other which could have been conceived.*

And if from laws he descends to the contemplation of arrangements, he finds the same truth as powerfully demonstrated. The planets are so balanced in their courses, that perfect stability is assured to the system. The seasons, as they change, restore to the air its life-supporting powers. Every plant, every animal, is suited to its position. It is at this stage of the argument for a Creator that evidence crowds on the mind. The innumerable forms, the variety of positions, the complexity of arrangements, he finds all to resolve themselves into the accomplishment of an end by the fewest, and simplest, and best means; and what is perhaps of more importance, is the obvious application of so extensive a machinery to beneficial purposes as regards himself; he sees the beautiful adaptation of his physical, intellectual, and moral nature to the aspect of the universe around him—he sees how his organs of sense are fitted both to that which is without and to that which is within. The eye and the ear convey simplicity and harmony to his mind without effort, and the mind with equal facility receives and appreciates them.

Shew a man a piece of ordinary machinery of a complex nature, wheel upon wheel, lever upon lever, it shall give him little pleasure, highly as he may appreciate the ingenuity of the inventor; explain to him that all the complexity and variety which he beholds is but the repetition of one simple and elegant principle, and he will scarcely fail to experience a proportionate delight. Such a machine is nature, and the explanation of the simplicity of her processes is daily being made clearer and fuller, as the intellect searches deeper into her laws; whilst it is discovered that the pleasurable sensations which arise out of man's witnessing the phenomena, can be traced to the power which he unconsciously possesses of appreciating simplicity, and of being influenced by its exhibition—thus proving that He who made the external world impressed on the mind the stamp of those very fingers which had left the creating work, and fixed there just such powers of apprehension as would harmonise with nature, and declaring that, when creation was pronounced very good, it was so styled in reference to man.

The investigations which have been detailed in this essay, it is therefore hoped, will assist in proving that harmony and simplicity constitute the beauty of creation, and not only shew that the noblest work of creation responds perfectly to this test of its proportions, but prove that He who moulded external nature placed in the mind of man the power to judge of His work, and discriminate amongst the various degrees of beauty it develops. It is no argument against what is here advanced, to say that these emotions cannot be traced to their ultimate causes. How rare is it that any of our sensations can be referred to other than secondary causes! Powers were conferred on man of which he could avail himself long before he was aware, except indirectly, of their very existence. The

minute comparison of intervals of time or of velocity which enables him to distinguish separate notes of sound; the accurate estimation of position whereby he at once, and with certainty, places his finger on any part of his body; the exact measurement of magnitude which gives him the knowledge of the form and size of objects at a distance;—these are powers which a man exercises involuntarily, which he acquired he knows not how, and, when acquired, is hardly aware that he possesses them. The same remark applies to the system developed in this treatise; for here an attempt has been made to prove that the mind is in like manner capable, through the eye, of judging of symmetry or of proportional beauty by seizing on the prominent points of an object and inquiring what are the relative directions which the other points occupy as seen from these. It has also been made to appear that the highest standard of symmetry so estimated is deduced from the simplest law that could have been conceived—the law that the angles of direction must all bear to some fixed angle the same simple relations which the different tones in a chord of music bear to the fundamental note — that is, relations expressed arithmetically by the smallest natural numbers. No other law, it is presumed, can be devised half so simple as this; it accords well with the other laws of nature. It is but another form of that great law of least effort which has been referred to above as pervading and regulating the system of the universe. The labour it imposes on the eye is simply to measure round a point. The measures which it demands are the easiest and readiest which could possibly be required to estimate the halves, the thirds, and the other simple proportions of the assigned unit. No other law could have given such repose to the eye; no other law could have presented its results to the mind in a form so plain and unmistakable. It is exhibited

under a form, indeed, which we know the mind to be capable of judging from, for it is the identical form under which the ear presents to it an harmonious combination of sounds; and it does not a little strengthen the argument which has been drawn of the wisdom of the Creator, to find sensations so widely different as these brought back to the same ultimate type. The repetition of the law, no less than its simplicity, proves the skill of Him who implanted obedience to it in the mind. It may be added, that the researches of modern science are continually tending to reduce all external nature to a series of combinations of simple types. The body and the limbs of the animal, the stem and the leaves of the plant, all appear to spring out of the same elementary form; and it is to be anticipated *à priori*, as it is trusted it has been proved by what has preceded, that man, the image of his Maker, has even in his low estate a frame based on the type of the most perfect conceivable symmetry—that relations the most simple and most perfect mark the position of all his limbs and run through every part of his framework. The rule of judging, therefore, which the intellect is constrained to apply to every object presented to it by the eye, will, when applied to the human figure, produce the most perfect result, so that the mind is constructed in full harmony with the body; and man's judgment of the beautiful, like his other powers, proves his high origin, and unites him in devout gratitude to his Maker.

## NOTE.

It will be observed that in plate II. the arms of the figure, as viewed in front, are removed from the normal position which they occupy in fig. 1, plate XI. of my last work. The cause of this is, that the space occupied by the muscles of the haunches of a well-formed female prevents the arms from hanging vertically as they do in the skeleton. The circles which, in the diagram, represent the condyles of the bones of the upper part of the arms and of the wrist joints, as thus removed, are given in dotted lines. The normal posture of the figure necessarily conceals in the trunk the curves of the latissimus dorsi between (9) and (10), in the arms, part of that of the triceps extensor between (9) and (34), and in the thighs that of the gracilis and sartorius muscles between (26) and (27).

## ERRATA.

Page 17, line 6, *for* platzsma-myoides, *read* platysma-myoides.

„ 32, line 1, *for* No. 3, *read* No. 1.

# APPENDIX.

THERE can be little doubt that the ancient Greek artists studied nature by dissection, as well as from the living subject, for they could not have become such perfect artistic anatomists by any other means. Their acquaintance with the human form, however, did not stop here: for they seemed to have acquired a knowledge beyond what nature thus afforded them—a knowledge by which they were enabled to arrive at a typical beauty, equally adapted to representations of the male and female forms.

Fragments of their exquisite works—the result of this combination of scientific knowledge with the powers of intuitive genius, have been long and deservedly looked up to by students in the arts of design, as affording models of the highest perfection. But although the artist is thus convinced that something beyond a copy of mere ordinary nature is required to constitute a work of high art, and although these works may greatly tend to excite his admiration and enthusiasm, yet a mystery hangs over the principle which they involve—a mystery that never can be penetrated by the eye, any more than a knowledge of the animal functions of the human body can be arrived at by examining its external surface.

It is, therefore, much to be regretted that no definite account of the system of proportion employed in these works is to be found in the works of any of the writers of that period—a system which evidently had reference æsthetically to the substructure of the human figure as well as to its external configuration.

Vitruvius is the only ancient writer in whose works are to be found an attempt to explain what were considered by the ancient Grecian artists the proportions which belong to a well-formed human being. The following are his words, as translated by Wilkins (London, 1812):—

"Nature, in the composition of the human frame, has so ordained that the face, from the chin to the highest point of the forehead whence the hair begins, is a tenth part of the whole stature; the same proportion obtains in the hand measured from the wrist to the extremity of the middle finger. The head, from the chin to the top of the scalp, is an

eighth, *and as much from the bottom of the neck.* A sixth part is given to the distance from above the chest to the highest point of the forehead; *and from the same point to the top of the skull, is a fourth of the whole stature.* If the length of the face from the chin to the roots of the hair, be divided into three equal parts, the first division determines the place of the nostrils, and the second the point where the eyebrows meet. The foot is a *sixth part* of the height of the entire frame; the cubit *and the chest* are each a fourth. The other members have certain affinities which were always observed by the most celebrated of the ancient painters and sculptors, and we must look for them in those productions which have excited universal admiration. The navel is naturally the centre point of the human body, for if a man should lie on his back with his arms and legs extended, the periphery of the circle which may be described about him, with the navel for its centre, would touch the extremities of his hands and feet. The same affinities obtain if we apply a square to the human figure, for, like the contiguous sides, the height from the feet to the top of the head is found to be the same as the distance from the extremity of one hand to the other when the arms are extended." In giving these lineal measurements, however, no general principles or laws of symmetry are developed, while some of the given dimensions (those in italics) are evidently erroneous. It would appear from the first of these, that the neck should be as long between the chin and the chest as the vertical length of the head; from the second, that between the highest point of the forehead and the top of the skull the vertical length should be two-thirds the length of the head, leaving only one-third for the length of the face; and from the third, that the length of the chest should be equal to one-fourth the whole stature, which is more than twice the length of the breast-bone. With these three exceptions, and that the foot is stated at one-sixth instead of one-seventh the full stature, the measurements are generally such as belong to the typical female figure, or to a delicately-formed youth, and consequently agree with the theoretical figure constructed upon the diagram whose fundamental angle is the right angle. But they do not apply to the typical male figure, whose frame must express greater strength, and whose fundamental angle must be larger than a right angle; for, in such a figure, there is a corresponding increase in the relative length of the head, and, although the arms themselves remain of the same relative length, yet, as the breadth of the shoulders is greater, the distance between the ends of the two longest fingers when the arms are stretched out laterally, will be more than the full stature. Vitruvius concludes by

observing :—" Since, therefore, the human frame appears to have been formed with such propriety that the several members are commensurate with the whole, the artists of antiquity must be allowed to have followed the dictates of a judgment the most rational when, transferring to the works of art the principles derived from nature, every part was so regulated as to bear a just proportion to the whole. Now, although these principles were universally acted upon, yet they were more particularly attended to in the construction of temples and sacred edifices, the beauties or defects of which were destined to remain as a perpetual testimony of their skill or of their inability."

It appears from what is here stated, that Vitruvius believed in such principles of symmetrical beauty being universally acted upon by the ancient Grecian artists, as were derived from the " composition of the human frame," and that " these principles were more particularly attended to in the construction of temples and sacred edifices." But the mere lineal measurements of the human frame which he gives, constitute no law of proportion universally applicable in architecture and the other formative arts, such as he here indicates.

From this fact, and from the errors I have pointed out in the measurements themselves, it may be presumed that the belief of Vitruvius, although founded in fact, was derived from traditional and imperfect information; and this is the more likely to have been the case, when we consider that his work (the only one upon the subject that has come down to us from antiquity) was written about four hundred years posterior to the best period of Greek art.

That a certain and definite law of proportion, common to architecture and the other formative arts, as well as to sculpture, was a main object of artistic study by the ancient Greeks, cannot be doubted; and that it was found to be fully developed in the human figure, as Vitruvius states, seems equally certain.

As a proof that the law attempted to be developed in the text is as applicable to architecture as to sculpture, it is only requisite to state that seven of the eleven angles, from which the proportions of the typical female form are here derived, give the general proportions of the principal portico of the Parthenon of Athens, thus :—

| | | |
|---|---|---|
| Female figure, | $(\frac{1}{2}), (\frac{1}{3}), (\frac{1}{4}), (\frac{1}{5}), (\frac{1}{6}), (\frac{1}{7}), (\frac{1}{8}), (\frac{1}{9}), (\frac{1}{10}), (\frac{1}{12}), (\frac{1}{14})$ | of the right angle. |
| Portico of the Parthenon, | $(\frac{1}{3}), (\frac{1}{4}), (\frac{1}{5}), (\frac{1}{6}), (\frac{1}{7}), (\frac{1}{8}), (\frac{1}{9})$ | of the right angle. |

The manner of applying these angles to the portico is given in my last work.

Since the time of Vitruvius many attempts have been made to apply systematic proportions to the human figure. The first and most prominent of these is the work of Albert Durer, a distinguished painter and engraver of Nuremberg of the fifteenth century. It was written in the German language; translated into Latin, and published at Nuremberg in 1532; translated into French, and published at Paris in 1557; and lastly, into Italian, and published at Venice in 1591. It is a work of great labour, and is divided into four books, each of which is illustrated by numerous wood engravings. In the first book the author gives the measurements of ten figures—five males and five females, of corresponding proportions. He commences his series with what he terms a stout villager, or peasant in good condition. The height of this figure is seven times the vertical length of his head, and his breadth at the shoulders little short of one third of his full stature. Of this figure there are three outlines, giving a front, a side, and a back view, the proportions of which are explained by upwards of eighty lineal measurements. A female figure to correspond is illustrated in the same manner. These figures, although very coarse specimens of the human form, are nevertheless remarkably well drawn, and their proportions quite natural and consistent. The other figures in this book gradually arise from these squat specimens to the slender, ending with a figure so attenuated in his proportions, that his stature is about ten times the vertical length of his head, and his breadth at the shoulders considerably less than one fifth of his stature. The proportions of this figure, as well as of the others towards the conclusion of the first book, are explained by about one hundred lineal measurements.

The second book illustrates another, and what the author terms a more exquisite, method of proportioning a similar but more numerous series of figures. This is even more complex than the first, inasmuch as in one figure the proportions require a series of one hundred and four different measurements.

In the third book the varieties of proportion to be found in ordinary nature are carried to the extreme, for the illustrations commence with a figure so squat that his full stature is only six times the vertical length of his head, while his breadth at the shoulders is considerably more than one third part of his full stature; and the series ends with a figure so tall and thin that his stature is about ten times the vertical length of his head, and his breadth at the shoulders little more than one sixth part of his full stature.

In the fourth book these figures are given in various positions, which are as devoid of grace as the figures are of typical beauty. This work, however, is still decidedly the best that has been produced upon the lineal measurements of the human figure.

John Cousin, a French painter of the sixteenth century, patronised by Henry II., and considered the earliest historical painter of note connected with the French school, published a work upon the proportions of the human figure, which we are told by Dr Fau, in his "*Anatomy for Artists,*" *translated by Dr Knox*, 1849, contains the principles which are now generally followed in the schools.

It consists, first, in dividing the height of the figure into eight parts, which are called heads, and thus appropriated:—

| | HEADS. |
|---|---|
| "From the summit of the head to the lower part of the chin, | 1 |
| „ „ inferior part of the chin to the nipple, . . . | 1 |
| „ „ nipple to the navel, . . . . . | 1 |
| „ „ navel to the genitals, . . . . . | 1 |
| „ „ genitals to the middle part of the thigh, . . | 1 |
| „ „ middle of the thigh to the knee, . . . . | 1 |
| „ „ knee to below the calf, . . . . . | 1 |
| „ below the calf to the heel, . . . . . | 1 |

"The head is then divided into four equal parts, which are thus appropriated:—

| | PARTS. |
|---|---|
| "From the summit of the head to the setting on of the hair, . | 1 |
| „ „ commencement of the hair to the root of the nose, | 1 |
| "The nose, . . . . . | 1 |
| "From the lower part of the nose to the inferior part of the chin, | 1 |

The following is a specimen of the manner in which the details are given:—

| | HEADS. |
|---|---|
| "From the shoulder-joint to that of the wrist, . . . | 2 |
| „ „ wrist-joint to the extremity of the middle finger, . | 1 |
| „ „ genital parts to the sole of the foot, . . . | 4 |

"The hands are as long as the face, and are divided into three lengths of the nose, with an additional length for the wrist.

"The length of the foot, seen in profile, is four times the length of the nose, or one head. It is divided into three parts, equal to the diameter of the lower part of the leg.

"The ear extends from the line of the eyes to that of the nose; it is not so broad by a half.

"In front, the neck, viewed from the height of the nasal line, measures half a head in breadth; but on a line with the supra-sternal fossette it is as wide again; at the commencement of the shoulders, the width of the neck equals a half of the five parts into which the length of the head and neck may be divided.

"From one shoulder to the other we reckon two heads; the diameter of the haunches on a line with the navel, as well as the width between the trochanters, measures six parts.

"Viewed in profile, we find five noses from the shoulder to the nipple; to the line of the navel, one head; to beneath the buttock, five and a half parts.

"Anteriorly, and at the elbow, the arm measures in breadth a third of a head, one part at the wrist, and three-fourths of a nose at the articulation. Externally and internally, the thickness of the arm equals two noses towards the shoulders, and one nose two-thirds at the elbow, a third of a head below the bend of the elbow, and one nose at the wrist." * * *

The above is only a small portion of a long extract made by Dr Fau; but it will give the reader an idea of the present low state of the science of proportion in our schools of design.

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